The advent of big data points to a deeper understanding of everything from physical and biological systems to social and economic behaviors. New technologies are emerging to organize and make sense of the world -- identifying regularities and patterns that allow us to advance scholarship, improve quality of life, and create commercial and social value.

Data sciences is emerging as an interdisciplinary field that extracts knowledge and insights by combining mathematics, social sciences, information technology and computer science. From centuries-old analog content that has been digitized to information collected almost instantly from web logs, mobile devices, transactions and sensors, the world is filled with data waiting to be utilized. Anyone generating or producing data can use data sciences.

**New insights through experiments and simulations**

The Applied Visualization Laboratory (AVL) at the Center for Advanced Energy Studies focuses on data sciences and how it can empower researchers and scientists to discover new insights through data analytics and visualization capabilities.

A key focus of the lab is real-time and near-real-time methods for processing, exploiting and analyzing experimental and simulated results.

The AVL includes an operational component for researchers and scientists, as well as scientifically-based research into new methods that transition over time to INL's broader scientific mission. Areas of expertise include:

- Physically-based/non-statistical models and schemes
- In-situ visualization of massive data sets
- Approximate methods of analysis, including predictive analytics
- Hierarchical storage methods of massive data sets
- Image processing and exploitation techniques
- Advanced mathematical methods for data processing, filtering, de-noising and validation
- Data fusion of experimental and computed results, along with verification and validation of models used in scientific research
- Collaboration techniques used in data sciences to enable large multi-laboratory projects
Enabling Scientific Research Using SIEVAS

Scientific research projects at CAES and INL use a suite of open-source data science software tools called the Scientific & Intelligence Exascale Visualization Analysis System (SIEVAS). This software allows researchers and scientists to analyze their massive amounts of data rather than consuming time on development of their own software. Tools such as Paraview, Matlab, Visit and Google Earth can be easily connected to SIEVAS to allow for tight integration into the users’ existing workflows. Additionally, immersive environments, such as the Computer-Assisted Virtual Environment (CAVE) and virtual reality systems, provide an ideal verification and validation environment for research methods in data science and analytics.

Data Science Research Capabilities

- Machine learning
- Visualization
- Data fusion/mining/analytics
- Pattern recognition
- Predictive analytics
- Data warehousing
- High-performance computing
- Big data
- Artificial intelligence

Researchers in the Computer-Assisted Virtual Environment (CAVE) view data points that graphically chart levels of seismic activity around the world over several years.

About CAES

The Center for Advanced Energy Studies (CAES), a consortium of Idaho National Laboratory, Boise State University, Idaho State University, University of Idaho, and University of Wyoming, is a public/private research center that provides research capabilities, energy-related educational opportunities, and industry assistance to fuel economic growth.

For More Info

James Money
Applied Visualization Laboratory Lead
(208) 526-7256
james.money@inl.gov

Julie Ulrich
Communications
(208) 526-1572
julie.ulrich@inl.gov

www.caesenergy.org